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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/808,802	03/25/2004	Fu-Kai Yang	TS03-186	6030
8933	7590	01/21/2005	EXAMINER	
DUANE MORRIS, LLP IP DEPARTMENT ONE LIBERTY PLACE PHILADELPHIA, PA 19103-7396			GURLEY, LYNNE ANN	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 01/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/808,802

Applicant(s)

YANG ET AL.

Examiner

Lynne A. Gurley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.


LYNNE A. GURLEY

PRIMARY PATENT EXAMINER
TC 2800, AU 2812

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the amendment filed 11/1/04.

Currently, claims 1-29 are pending.

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

2. Claim 1 and 16 are objected to because of the following informalities:
3. In claim 1, line 16, "removing portion" should be "removing a portion".
line 17, "plus" should "plug";
line 18, "removing portion" should be "removing a portion".
In claim 16, line 15, "using a said" should be "using said";
line 20, "remove portion: should be "removing a portion";
line 24, "remove portion" should be "removing a portion".
Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459

(1966), that are applied for establishing a background for determining obviousness under 35

U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (US 6,642,153, dated 11/4/03, filed 7/31/02) in view of Nagahara (US 2002/0192945, dated 12/19/02).

Chang shows the method as claimed in figures 2-3 and corresponding text, with conductive structure 20; insulator stack 22A (first liner layer), 24A (first insulator layer), 22B (second liner layer), 24B (second insulator layer) and 26 (antireflection layer); via opening 28A

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(fig. 2B); trench opening 28B and resist plug 30; removing portion of the second liner layer (fig. 2D-2F); removing the photoresist shape and plug (fig. 2E); removing portion of the first liner layer exposed in the via opening, exposing a portion of a top surface of the conductive structure (fig. 2F). The photoresist plug is removed using plasma oxygen ashing procedures.

Chang lacks anticipation only in not teaching a capping layer; deposition of the liner layers and insulating layers by PECVD; RIE etching procedures, etchants and etch rate ratios; and, via opening diameter.

Nagahara teaches, in a similar method, the use of a capping layer in conjunction with an antireflection layer in patterning a dual damascene contact, which also uses a sacrificial photoresist plug to protect the via during processing.

It would have been obvious to one of ordinary skill in the art to have incorporated the capping layer, in the method of Chang, as taught in the method Nagahara, with the motivation that the capping layer would provide additional protection to the uppermost insulating layers against moisture, impurities as is conventional in the art. Additionally, the cap layer would not interfere with the use or benefits of the antireflection layer and the claimed insulating layers of the instant invention.

It would have been obvious to one of ordinary skill in the art to have had the deposition of the liner layers and insulating layers be by PECVD; to have used RIE etching procedures, etchants and etch rate ratios to etch the via and trench contact holes and the claimed layers associated therewith; and, to have had the claimed via opening diameter, in the method of Chang, with the motivation that it is well known to one of ordinary skill in the art to use PECVD, as an alternative to the LPCVD used in Chang, to deposit the claimed layers, as it is also well known

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to use RIE procedures and to have the claimed via diameter, barring some expression of criticality.

8. Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harada et al. (US 6,251,774, dated 6/26/01) in view of Nagahara (US 2002/0192945, dated 12/19/02).

Harada shows the method as claimed in figures 1-4 and corresponding text, with emphasis on figure 4, with conductive structure 30; insulator stack 32 (first liner layer), 34 (first insulator layer), 36 (second liner layer), 38 (second insulator layer) and 58 (antireflection layer); via opening 46 (fig. 4C); trench opening 54/56 and resist plug 48; removing portion of the second liner layer (4E); removing the photoresist shape and plug (fig. 2E); removing portion of the first liner layer exposed in the via opening, exposing a portion of a top surface of the conductive structure (fig. 2F).

Harada lacks anticipation only in not teaching a capping layer; deposition of the liner layers and insulating layers by PECVD; RIE etching procedures, etchants and etch rate ratios; that the photoresist plug is removed using plasma oxygen ashing procedures; and, via opening diameter.

Nagahara teaches, in a similar method, the use of a capping layer in conjunction with an antireflection layer in patterning a dual damascene contact, which also uses a sacrificial photoresist plug to protect the via during processing. Nagahara also teaches removal of photoresist by oxygen ashing procedures.

It would have been obvious to one of ordinary skill in the art to have incorporated the capping layer and the oxygen ashing procedure, in the method of Harada, as taught in the method

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Nagahara, with the motivation that the capping layer would provide additional protection to the uppermost insulating layers against moisture, impurities as is conventional in the art.

Additionally, the cap layer would not interfere with the use or benefits of the antireflection layer and the claimed insulating layers of the instant invention. The oxygen ashing procedure is conventional as taught in Nagahara, enabled by Harada, with the acknowledgement that conventional procedures may be used.

It would have been obvious to one of ordinary skill in the art to have had the deposition of the liner layers and insulating layers be by PECVD; to have used RIE etching procedures, etchants and etch rate ratios to etch the via and trench contact holes and the claimed layers associated therewith; to have removed the photoresist using oxygen ashing procedures; and, to have had the claimed via opening diameter, in the method of Harada, with the motivation that it is well known to one of ordinary skill in the art to use PECVD, as an alternative to the LPCVD used in Harada, to deposit the claimed layers, as it is also well known to use RIE procedures and, to have the claimed via diameter, barring some expression of criticality.

Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stamper (US 6,297,149, dated 10/2/01) in view of Nagahara (US 2002/0192945, dated 12/19/02).

Stamper shows the method as claimed in figure 4 and corresponding text, with conductive structure 304; insulator stack 305 (first liner layer), 307 (first insulator layer), 309 (second liner layer), 311 (second insulator layer) and 313 (antireflection layer); via opening 315 (fig. 4C); trench opening 405 and sacrificial plug 401; removing portion of the second liner layer (4E); removing the photoresist shape and plug (fig. 4F); removing portion of the first liner layer

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exposed in the via opening, exposing a portion of a top surface of the conductive structure (figs. 4F-4G).

Stamper lacks anticipation only in not teaching a photoresist plug, a capping layer; deposition of the liner layers and insulating layers by PECVD; RIE etching procedures, etchants and etch rate ratios; that the photoresist plug is removed using plasma oxygen ashing procedures; and, via opening diameter.

Nagahara teaches, in a similar method, the use of a capping layer in conjunction with an antireflection layer in patterning a dual damascene contact, which also uses a sacrificial photoresist plug to protect the via during processing. Nagahar also teaches removal of photoresist by oxygen ashing procedures.

It would have been obvious to one of ordinary skill in the art to have incorporated the capping layer and the oxygen ashing procedure, in the method of Stamper, as taught in the method Nagahara, with the motivation that the capping layer would provide additional protection to the uppermost insulating layers against moisture, impurities as is conventional in the art. Additionally, the cap layer would not interfere with the use or benefits of the antireflection layer and the claimed insulating layers of the instant invention. The photoresist plug would serve the same purpose as the filler plug in Stamper. The oxygen ashing procedure is conventional as taught in Nagahara, enabled by Stamper, with the acknowledgement that conventional procedures may be used.

It would have been obvious to one of ordinary skill in the art to have had the deposition of the liner layers and insulating layers be by PECVD; to have used RIE etching procedures, etchants and etch rate ratios to etch the via and trench contact holes and the claimed layers

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associated therewith; to have removed the photoresist using oxygen ashing procedures; and, to have had the claimed via opening diameter, in the method of Stamper, with the motivation that it is well known to one of ordinary skill in the art to use PECVD, as an alternative to the LPCVD used in Stamper, to deposit the claimed layers, as it is also well known to use RIE procedures and, to have the claimed via diameter, barring some expression of criticality.

Response to Arguments

9. Applicant's arguments filed 11/1/04 have been fully considered but they are not persuasive. In response to Applicant's remarks, pages 9-11 of the response filed 11/1/04, wherein Applicant states that none of the applied references show or teach forming a photoresist shape including a trench-defining shape and a photoresist plug that completely fills the via opening, the Examiner responds that a two step formation of the photoresist shape is not precluded by the claim language. In the references, the plug is usually formed first and, then the trench-defining shape is formed. However, both the plug and the trench-defining shape are used in combination, simultaneously to perform the etching for the trench opening. The two step formation of the plug and the trench-defining step is not precluded in the language of the claim. The claim calls for the trench-defining step to be used as the etch mask and it is.

10. Also, the photoresist plug completely filling the via **in the first portion of the stack of insulator layer** (i.e. the lower layers of the stacked insulation) is fulfilled. The claim does not call for the via to be completely filled in relationship to the second portion of the stack of insulators. So, when looking at the references, it is clear that the photoresist plug fills at least the first portion of the stack of insulators.

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11. Additionally, in response to Applicant's remarks, pages 10-11, regarding Nagahara not teaching the photoresist plug, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Nagahara suggests that a photoresist plug may be used in the plug in figure 6 in a two step etching process of the trench (figs. 6C-7B) wherein the photoresist plug completely fills the via opening (fig. 6C) and then is etched in figs. 7A and fig. 7B.. The claim calls for the trench defining shape to be the etch mask for the trench, and it is in fig. 7B, even though the plug has been removed by this time. The claim does not preclude these steps which are shown in the reference.

12. In conclusion, the Examiner finds that the references meet the claimed limitations as explained above. The Examiner suggests that Applicant try to **more specifically** point out the use of the photoresist shape including the trench-defining shape and a photoresist plug in the etching process.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

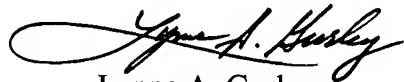
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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is 571-272-1670. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 571-272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Lynne A. Gurley
Primary Patent Examiner
TC 2800, Art Unit 2812

LAG
January 18, 2005